(12) PATENT APPLICATION (11) Application No. AU 198818507 A1
(19) AUSTRALIAN PATENT OFFICE (10) Patent No. 613927

(54) Title
Coupling

(51) International Patent Classification(s)
F16D 041/06

(21) Application No: **198818507** (22) Date of Filing: **1988.06.29**

(30) Priority Data

(31) Number	(32) Date	(33) Country
PI2756	**1987.06.29**	**AU**

(43) Publication Journal Date: **1989.01.05**
(44) Accepted Journal Date: **1991.08.15**

(71) Applicant(s)
Samuel Arthur Thomas Woodbridge

(54) Inventor(s)
Samuel Arthur Thomas Woodbridge

613927

COMMONWEALTH OF AUSTRALIA

LODGED AT SUB-OFFICE 29 JUN 1987 Brisbane

PATENT OFFICE 60 SIXTY DOLLARS

The Patents Act - 1952

APPLICATION FOR A PATENT

I, SAMUEL ARTHUR THOMAS WOODBRIDGE,

of 85 Bunya Street, Greenslopes, Queensland, 4120, Australia,

hereby apply for the grant of a Patent for the invention entitled:

"COUPLING"

which is described in the accompanying Provisional specification.

My address for service: C/- GRANT ADAMS & COMPANY, Patent Attorneys, of 333 Adelaide Street, Brisbane, in the State of Queensland, 4000, Commonwealth of Australia.

DATED this twenty-ninth day of June, 1987.

SAMUEL ARTHUR THOMAS WOODBRIDGE,
By his Patent Attorneys,
GRANT ADAMS & COMPANY.

J.G. Adams.

TO: The Commissioner of Patents,
COMMONWEALTH OF AUSTRALIA.

COMMONWEALTH OF AUSTRALIA
Patents Act 1952

DECLARATION IN SUPPORT OF AN APPLICATION FOR A PATENT

In support of the Application made by me for a Patent for an invention entitled "COUPLING",

I, SAMUEL ARTHUR THOMAS WOODBRIDGE
of 85 Bunya Street, Greenslopes, Queensland, 4120, Australia

do solemnly and sincerly declare as follows:

1. I am the Applicant for the Patent.
2. I am the actual inventor of the invention.

Declared at Greenslopes 4120

this 30th day of June 1988.

Samuel Arthur Thomas Woodbridge
SAMUEL ARTHUR THOMAS WOODBRIDGE

TO:

The Commissioner of Patents
COMMONWEALTH OF AUSTRALIA

(12) PATENT ABRIDGMENT (11) Document No. AU-B-18507/88
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 613927

(54) Title
COUPLING

International Patent Classification(s)
(51)[4] F16D 041/06

(21) Application No. : 18507/88 (22) Application Date : 29.06.88

(30) Priority Data

(31) Number PI2756 (32) Date 29.06.87 (33) Country AU AUSTRALIA

(43) Publication Date : 05.01.89

(44) Publication Date of Accepted Application : 15.08.91

(71) Applicant(s)
SAMUEL ARTHUR THOMAS WOODBRIDGE

(72) Inventor(s)
SAMUEL ARTHUR THOMAS WOODBRIDGE

(74) Attorney or Agent
GRANT ADAMS & COMPANY , GPO Box 1413, BRISBANE QLD 4001

(56) Prior Art Documents
AU 51282/85 F16D 41/06
AU 45974/68 95.9
AU 25342/67 62.7

(57) Claim

1. A coupling for the transmission of power between a first powered rotationally movable element and a second driven rotationally movable element said coupling comprising:

a first member associated, in use, with the first rotationally movable element, which first member is supported for rotation;

a second member associated, in use, with the second rotationally movable element, which second member is supported for rotation;

an interengagement mechanism interposed between the first and second members to couple them together in either direction of rotation of the first member; and

an inertia mechanism operatively connected to the interengagement mechanism;

the interengagement mechanism including an interengagement means which effects interengagement of the first and second members to effect their operative coupling when angular movement of the first member would otherwise result in the first member over-running the second member;

.../2

the inertia mechanism being operative to prevent the engagement means effecting interengagement during angular movement of the second member which causes it to over-run the first member, the inertia mechanism locking the interengagement means in a disengaged state for the duration of this over-run condition.

613927

COMMONWEALTH OF AUSTRALIA

Patents Act 1952

Name of Applicant	:	SAMUEL ARTHUR THOMAS WOODBRIDGE
Address of Applicant	:	85 Bunya Street, Greenslopes, Queensland, 4120, Australia
Actual Inventor(s)	:	SAMUEL ARTHUR THOMAS WOODBRIDGE
Address for Service	:	GRANT ADAMS & COMPANY, Patent & Trade Mark Attorneys, 333 Adelaide Street, BRISBANE. QUEENSLAND. 4000 AUSTRALIA.

COMPLETE SPECIFICATION FOR THE INVENTION ENTITLED:

"COUPLING"

The following statement is a full description of the invention including the best method of performing it known to the applicant.

THIS INVENTION relates to couplings for disconnectably connecting the rotating output of one member to another rotary member.

Many different forms of clutch mechanisms have been devised whereby one rotating member may be coupled to another in a disconnectable manner. The clutch may operate selectively, at the discretion of an operator or it may be self engaging. In four wheel drive vehicles, for example, the power applied at one axle may be transmitted to the other via a drive shaft therebetween. In turning, one set of wheels may be required to turn faster than the other, through following different paths with different curvatures. To enable this, the drive shaft may be split and coupled through a mechanism that operates as a self engaging clutch in either direction of rotation, whilst allowing the driven shaft to over-run should it be required to turn at a speed in excess of the driven speed. Similar structures are useful in a variety of other like circumstances.

It is an object of the present invention to provide a coupling of the above character for application where a secondary rotary member is to be engaged with a rotating primary member, with the secondary member being able to be run freely at greater angular speeds than that of the primary member. Other objects, and various advantages, of the present invention will hereinafter become apparent.

The invention provides a coupling for the transmission of power between a first powered rotationally movable element and a second driven rotationally movable element said coupling comprising:

a first member associated, in use, with the first rotationally movable element, which first member is supported for rotation;

a second member associated, in use, with the second rotationally movable element, which second member

is supported for rotation;

an interengagement mechanism interposed between the first and second members to couple them together in either direction of rotation of the first member; and

an inertia mechanism operatively connected to the interengagement mechanism;

the interengagement mechanism including an interengagement means which effects interengagement of the first and second members to effect their operative coupling when angular movement of the first member would otherwise result in the first member over-running the second member;

the inertia mechanism being operative to prevent the engagement means effecting interengagement during angular movement of the second member which causes it to over-run the first member, the inertia mechanism locking the interengagement means in a disengaged state for the duration of this over-run condition.

The interengagement members may be either of rollers or sprags as will become clear in the following description. The coupling in either of these last two forms may be provided with an overdrive and particular arrangements that give effect to this are outlined below.

The coupling of this invention may be put into operation as either of a one-way or two-way clutch with an over-run capability. The coupling has particular application in situations as arise in four-wheel drive vehicles. Additionally, it is possible to provide the coupling with an over-drive by adoption of a modification to the outer or second member.

Throughout the specification, the below listed terms are to be attributed with meanings at least as broad as those defined hereunder unless the context at

any particular point establishes something more specific.

Couplings:- is a means by which two rotary actions are mechanically coupled by action of a mechanism that locks the elements transmitting the rotary action together in the nature of a clutch but with the capacity to be disengaged and or otherwise permit the output to over-run the input when circumstances dictate.

First member:- is that which is coupled to that element which provides the drive, primary or rotary input that is to be coupled to that element that is the driven, secondary or rotary output and is alternately referred to as the drive gear, star gear, sprag gear and may be coupled to the primary rotary input or drive element either indirectly with or without any intermediary gear train, torque converter or other angular speed changing mechanism, or directly by action of meshed splines, key and key way, or other locking mechanism.

Second member:- is that which is coupled to that element which is the driven, secondary, or the rotary output that is to be coupled to that element that is the drive, primary or rotary input and embodies the tubular section or body whose inner surface is engaged by the interengagement means to lock the coupling and may comprise a tubular body closed at one or both ends by end plates that close or house the coupling against external factors and establish points at which the driven element may be connected by bolting on the driven element or other interconnection means which alternately may engage with the tubular action itself.

Tubular section:- provides an inner surface against which the interengagement means bind to lock the coupling, which inner surface may be smooth or ridged by either of recesses within the surface into which the

interengagement means may become keyed or projections raised therefrom to catch the interengagement means, the inner surface serving its purpose either by frictional engagement or mechanical interaction.

Interengagement means:- are a mechanism whereby the relative motion of the first and second members is controlled with the torque say on the first member transmitted to the second member in such a way that whilst the first member may not over-run the second member, the second member is free to over-run the first, the action being permitted either in one direction of rotation, or either direction of rotation, the interengagement members being rollers, sprags, or other suitable devices.

Rollers:- are rotary interengagement means that may be reduced from elongate rollers to a disc form that are retained in their orientation by end walls of the coupling, the roller lengths being determined by the desired size of the coupling and the forces established therein in any chosen operation.

Sprags:- may be twin sprags effective in either direction of rotation whose tilt about the first member is determined by the direction of rotation and the operation of an inertia mechanism when such mechanism is in place; the sprags may have a variety of overall geometrics, and geometrics to those segments that interengage with the second member.

Inertia mechanism:- is a means by which the action of the interengagement means is controlled so as to prevent unwanted ~~locking~~ engaging in an over-run situation and may comprise a single plate, segment etc. or a number of plates, segments, etc. interacted to compound their inertia, utilised in such a way as to limit, according to the inertia, the degree of movement permitted to the interengagement means with or without interceding locking buttons.

Buttons:- may be discs, balls, elongate segments, etc. that act as intermediaries in the inertia mechanism, serving to limit the degree of free play established in the inertia mechanism or finger plate interconnected thereto.

Finger plate:- is a means that interacts with the interengagement means so as to effect control over the interengagement means and may comprise a plate with pegs, lugs or other projection means thereon interdigitated with the interengagement means, the finger plate, inertia mechanism and first member being associated together in any workable relative disposition, for example with the finger plate being abutted coaxially to the first member with an inertia plate therebetween, or sandwiched between the first member and an inertia plate.

The invention will now be described with reference to preferred embodiments which are shown in the accompanying drawings wherein:-

FIGS. 1 and 2 are part open views of a coupling in accordance with the present invention,

FIG. 3 is a transverse section through the coupling of FIGS. 1 and 2,

FIG. 4 shows a transmission system incorporating a pair of couplings in accordance with the present invention,

FIG. 5 is a part open view of an alternate form of the coupling,

FIG. 6 depicts a finger plate as is used in the coupling of FIG. 5,

FIG. 7 is a transverse section through the coupling of FIG. 5,

FIG. 8 shows another modified form of the coupling,

FIG. 9 shows an alternate embodiment employing twin sprags, and

FIG. 10 shows a coupling fitted with an overdrive.

The coupling herein described operate on the same general principle to allow for over-running. Each of the preferred embodiments employ a tubular body or tubular section on a second member that may be integrally blanked off at one end and which may serve as the driven member. The other end of the tubular body may be closed off with provision for a drive shaft to enter by way of journals, seals, etc. Inside the tubular body, fitted to the drive shaft, is a gear that may have nine points, sometimes referred to as the star gear or first member, or it may be the means to maintain double ended sprags to be referred to as the sprag gear. As the drive shaft commences to rotate, either clockwise, or anti-clockwise, the star gear will cause nine rollers to wedge against the inner periphery of the tubular body or section and rotate the tubular body in the same direction as the drive gear. Alternately, when employing the double ended sprags, sometimes referred to as twin sprags, the initial rotation of the sprag gear will cause the twin sprags to lag back against the direction of rotation and wedge against the inner periphery of the tubular body and rotate it in the same direction as the sprag gear.

Whilst the coupling is effective to engage and lock the parts to transmit a driving force, when there is cause for the tubular body to rotate faster than the star gear, the rollers will unwedge themselves (due to the lack of pressure from the star gear) and lie in a disengaged position between adjacent points of the star gear, thus allowing the inner periphery of the tubular body to pass over them without contact. Alternately, in the case of the twin sprag coupling, the twin sprags will unwedge themselves from the inner periphery of the tubular body (due to the lack of pressure from the sprag

gear) to rest at a half way position between their two extreme wedging positions whereat no contact with the tubular body occurs.

To prevent the possibility of the rollers or sprags, after unwedging when the tubular body begins to over-run, moving to lock in the other direction, a mechanism is provided that is effective to control movement of the rollers or sprags. In this mechanism there exists a plate with fingers which plate lags back against the direction of travel of the star or sprag gear. The fingers of the finger plate keep the rollers, or twin sprags, in the same relative position to the other rollers, or twin sprags, their inertia preventing unwanted over-run of the rollers or sprags and locking in the other direction. The mechanism may employ additional mechanisms to establish a controlling inertia that is effective on the rollers or sprags via the fingers of the finger plate.

An additional inertia mechanism may comprise an inertia plate interconnected to the star gear or sprag gear by locking buttons attached to the finger ~~inertia~~ plate and movable in recesses in the star or sprag gear. The recesses may be elongate with one end radially further from the axis than the other to form a locking slot. The finger plate may have pegs therein projected into the recesses so as to interact with the inertia plate thereby as will become clear below.

The coupling 10 of FIGS. 1 to 3 is contained within a tubular housing or body 13 which may be provided with end plates that may be sealed with a sealed bearing so as to provide an enclosed coupling as will become more clear below. A drive shaft 11 is joined to a drive gear 12 (the two may be a unitary structure). The drive gear 12 of FIGS. 1 to 3 is six sided with generally concave faces, such as 17, between nodes 14 and 15. Between each concave surface 17 and

the tubular body 13 is a roller 18 being sized to leave a gap between itself and either of the gear or the tubular body at their maximum separation. An overrun finger plate 16 is provided to control the rollers.

In operation, the drive gear 12, or star gear applies pressure to the roller 26 which in turn applies pressure to the ribs 19 in the tubular body 13 so as to cause it to rotate with the star gear 12. When the tubular body is caused to rotate faster than the star gear, the rollers would be carried forward against the next node to jam thereagainst and break any further forward movement. It is the function of the finger plate 16 to prevent this.

The finger plate 16 may be circular with six fingers 20 bent inwards at right angles to keep the six rollers 18 in position and prevent them from rolling up the wrong node. The finger plate is provided with a finger plate crescent 21, half moon shaped, attached thereto, as by rivetting etc., which is slidably fitted in a groove 22 in star gear 12.

This groove may be circular and typically 8mm wide. The finger plate crescent can also move a little way into the wider continuation 23 of the circular groove which may be 10mm wide. In the wider section 23 of the groove is provided an inertia crescent 24 and its travel is restricted by rollers 25 and 26 that may be flat and 10mm diameter within a 10mm groove 23. These rollers 25 and 26 are referred to below as buttons. They may not enter the narrower groove 22.

The inertia crescent 24 may be fitted with an upstanding inertia peg 27 passing through slot 28 in finger plate 16 so as not to restrict that plates movement for engagement in a hole in a heavier inertia plate 29 (see FIG. 3) which is supported for free coaxial rotary movement. The heavy inertia plate 29 controls the movement of the inertia crescent 24 which

in turn locks the buttons 25 and 26 into the locking slots 30 and 31. It is preferred that the rollers 18 be squat (preferably with their length and diameter the same) so that there is less chance of them falling over and no need for a cage at each end to orient the roller. Typical rollers might be 12 x 12 (mm).

The finger plate 16 and finger plate crescent 21 jointly, in conjunction with the heavy inertia plate 29 and the inertia crescent 24, all hang back against the direction of rotation of the star gear 12. In doing so, with an anticlockwise rotation as in FIG. 1, the button 25 cannot enter the groove 22 but is forced into the locking slot 30 (typically 3mm deep) by the shaped end 32 of the inertia crescent 24. The finger plate crescent 21 cannot dislodge the button because of inertia and the shape of the ends of the inertia crescent 24. The weight of the heavy inertia plate 29 and the finger plate 16, whilst lagging back against the direction of rotation of the star gear 12 and tubular body 13, causes the correct button to fall into its locking slot. Then the trapped finger plate is properly located to prevent the rollers 18 from being carried around by the ribs 19, should the tubular body 13 be turned at an angular speed greater than that of the star gear 12. (This is seen in FIG. 2). Without the finger plate, the rollers 18 would be carried forward against the back of the next node so as to brake any further relative motion.

The finger plate 16 is permitted to move a small distance when the tubular body 13 is overrunning the star gear 12, just enough to take up the clearance between the buttons and the finger plate crescent. This small movement is not sufficient to allow the rollers 18 to roll up the wrong ramp or node. They are kept within a determined range of movement by the finger plate 16 which is stopped by the button in the locking shot.

A coupling of the above character is able to be fitted in a variety of places in the drive chain of a vehicle, between the output from a gearbox, say, and the front pinion of a four wheel drive vehicle. It allows the differential to revolve at the same speed, and/or, freewheel faster, but never slower, than the rear differential, resulting in a solution of the problem of differential wind-up in either of forward and reverse gear. The coupling could be a retro-fit coupling or clutch, and in some cases the propellor shaft may have to be shortened.

The clutch is a positive drive as opposed to friction mechanisms and would engage in less than one eighth of a revolution so as to reduce shock loading. The coupling may be compact. Typically it might be 70mm long and 100mm in diameter.

The above described coupling may have any number of points to the star gear and the number of ribs needs to be a multiple of the number of points on the star gear. It should be clear that the device might function without the ribs with rollers jammed against a smooth inner surface of the tubular body by frictional contact. However, the adoption of ribs achieves a more positive contact and locking. The unit may, within its length, incorporate a drive flange 33 (see FIG. 3) which comprises spring loaded balls 34 and 35 held into recesses in the end plate of the clutch. The contact of these balls in their complementary recesses synchronise the speeds of the drive flange 33 and the tubular body 13 mounted to end plate 36 when the clutch is free wheeling and as a result the vehicle can be driven by putting it into and out of four wheel drive solely by moving the four wheel drive lever.

The above described coupling is preferable to a middle differential in the transfer case because there is positive drive to the front and rear differential and

there is no need for a differential lock as would be necessary when using any third differential.

FIG. 4 shows how the coupling might be incorporated into a transmission system. A drive shaft 37 turns a drive gear 38 and pinion 39 on rotating support 40 carrying gear 41 splined thereto. Gear 41 rotates gear 42 which turns coupling 43. Gear 42 has a ratio such as 1 to 1.14, turning the tubular body of coupling 43 slightly faster than output shaft 44 which is driven by side gear 45. Side gears 45 and 47 and thrust block 46 form the usual differential with the opposed output shaft 48 driven within a coupling 49 whose tubular body is overrun by a gear 50 turned by gear 51 on pinion support 52.

Use of the couplings 43 and 49 in the differential of FIG. 4 enables control of unnecessary wheel spin. This assembly enables an automatic means of controlling the rate of rotation of the two output shafts which might be the axles of a vehicle so that they do not differ from the rate of rotation of the crownwheel by more than a preset ratio. In the above example a ratio of 100 to 114 is suggested but variations are possible to suit usage. The result is a slip control differential which delivers full differential action at all times even on a full lock 360° turn without causing differential wind-up (or bind as it is sometimes referred to). Both output shafts (axles and wheels) must turn, even though one output shaft may be revolving 14% faster, while the other is 14% slower than the crown wheel, and both be under power, even if one wheel is airborne.

In FIG. 4, the tubular bodies of the couplings 43 and 49 are driven 14% faster than the crown wheel 39 via the idler gears 42 and 50 through the extensions 40 and 52 of the differential cage. The star gears of the couplings 43 and 49 are splined to the output shafts 44

and 48 and revolve within the tubular body at axle speeds. The star gears will never catch up to the angular speed of their tubular body unless that output shaft (and wheel) looses traction and spins to 114% of the crown wheel 5pm. As the overspinning wheel speeds up to 114% of the crown wheel speed (when the other wheel speeds down to 86% of crown wheel speed) the ribs in the tubular body will cause the rollers to wedge against the points of the star wheel. This wedging action restricts that axle speed to 114% of the crown wheel speed, which, in turn, means that the other wheel rotates at 86% of the crown wheel speed. Both wheels will revolve and in the same direction as the crown wheel, irrespective of whether the vehicle is going forward or is in reverse gear and both will be under power even if one wheel is air borne.

The upshot of the above is that if a spin control differential is used then there will never be occasions where one wheel is spinning and the other is stationary. It utilises a positive grip rather than a frictional one that can be unreliable and causes oil heating. It provides safer braking. One wheel cannot lock up. If the crown wheel turns, both wheels turn. Safer steering is achieved. With conventional differentials, if a vehicle rolls in a corner to lose traction at the inner wheel, there is no power to the outside wheel and centrifugal force takes over to roll the vehicle off the road. With the spin control differential wheel, the outside wheel always has power even if the inner wheel is airborne. Manufacturing costs are reduced because conventional parts, crown wheel, pinion, planetary and side gears are retained. Maintenance may be more necessary but only marginally so because the couplings are freewheeling most of the time.

The spin control differential could be used as a middle differential and it would not need a diff lock.

The ratio of the crown wheel to output shafts would only need to be in the order of 100 to 106 because in a medium wheel base 4WD, the front prop shaft speed will not exceed the rear prop shaft speed by more than 12% usually.

FIG. 5 shows another coupling which enables tubular body 13 to overrun in one direction but lock in the other depending on the positions of twin sprags 53 whose angle of tilt about pivot points 54 is governed by finger plate 58 (see FIG. 6) which overlies the assembly of FIG. 5 with finger plate slot 59 enabling sprag lug 60 to pass therethrough. Finger plate crescent 61 slots into the drive gear with the same finger plate assembly as in FIGS. 1 to 3. The lag of the inertia crescents, locking slot and locking buttons set the position of the finger plate and through it, the position of the twin sprags. The twin sprags are retained in primary member 62 in recesses 63 to be held by circlip 64 passed through an appropriate slot in the sprag at each side. When over-running, the twin sprags swing forwardly to clear the ribs 19 but only so far as is allowed by the length of slot 59 which captures lug 60 on the twin sprag. Finger plates may be provided at both sides of the primary member and be interconnected by pegs at 65.

FIG. 8 shows another construction which requires less machining so as to reduce costs. The groove in the star gear 12 is reduced and the crescents abandoned in favour of slots 66 and 67 containing buttons 68 and 69 having upstanding pegs 70 and 71 which freely pass through slots in an overlying finger plate to engage in holes in a heavy inertia plate whose movement pulls the buttons to move them about slots 66 and 67. Both slots 66 and 67 have locking slots 72 and 73 into which buttons 68 and 69 may be moved and a lug slot 74 and 75 into which a lug of the finger plate extends, behind the buttons, so that the finger plate

position is determined by the relative positions of the buttons. The overall operation of the coupling is as set out above. In this coupling, the more direct action of the inertia plate provides a more positive action in pulling the buttons out of their locking slots.

In FIG. 9, a first member 76 has a plurality of interengagement means thereabout, in the form of twin sprags such as 77, held by a circlip 78. Corners, such as 79, of the twin sprag lock into grooves such as 80 at the inner surface of the tubular section of the second member such that upon the first member being driven clockwise, the second member is carried forward but can over-run. A finger plate not shown, carries pegs, such as 81, to control the orientation of the sprags. The finger plate position is determined by its pegs 82 whose position is controlled by buttons 83. The buttons slide in the grooves shown and adopt a position dependent upon the inertia plate (not shown) which interacts with the buttons 83 via pegs 84 engaged therein in recesses for the purpose. The manner of operation of the inertia mechanism is similar to that which is described above. The inertia plate might be omitted if the finger plate inertia is adequate.

In FIG. 10, first and second members 85 and 86 are coupled by a ramp and roller type mechanism as set out above. An inertia plate (not shown) may interact with buttons 90 in grooves 91 in the first member with pegs 92 engaged in the elongate buttons. The position of the buttons 90 determines the movement of a finger plate (not shown) which has pegs 93 projected into recesses 91 for the purpose. The fingers 94 of the finger plate set the limits of travel of rollers 95. The second member carries a plurality of overdrive rollers such as 88 about its periphery that interact with an output member 87 with nodes such as 89 therein. The nodes and overdrive rollers differ in number to

effect a gearing such that the angular speed of the first member is varied at the output. An overdrive function is brought into play by this means. This coupling might be fitted to a bi-directional electric motor with, for example, an output speed of about 2800 rpm to reduce the output speed to say 2200 rpm and also allow the driven member to over-run when power is switched. It should be clear that the gearing established by the above overdrive mechanism will be determined by the ratio of rollers to nodes.

The unit may be lubricated with powdered graphite, retained by sealed bearings.

Whilst the above has been described with reference to a preferred embodiment, it will be apparent that various improvements and modifications as would occur to the man skilled in the art might be made thereto.

CLAIMS

The claims defining the invention are as follows:-

1. A coupling for the transmission of power between a first powered rotationally movable element and a second driven rotationally movable element said coupling comprising:

a first member associated, in use, with the first rotationally movable element, which first member is supported for rotation;

a second member associated, in use, with the second rotationally movable element, which second member is supported for rotation;

an interengagement mechanism interposed between the first and second members to couple them together in either direction of rotation of the first member; and

an inertia mechanism operatively connected to the interengagement mechanism;

the interengagement mechanism including an interengagement means which effects interengagement of the first and second members to effect their operative coupling when angular movement of the first member would otherwise result in the first member over-running the second member;

the inertia mechanism being operative to prevent the engagement means effecting interengagement during angular movement of the second member which causes it to over-run the first member, the inertia mechanism locking the interengagement means in a disengaged state for the duration of this over-run condition.

2. A coupling as claimed in Claim 1 wherein:

the second member is a tubular section, the first member is nested coaxially inside the tubular section, and there is provided, a plurality of interengagement means being interposed between the first member and the tubular section;

the plurality of interengagement means being movable between interengagement and freewheeling positions therebetween;

3. A coupling as claimed in Claim 2 wherein:

the interengagement means are rollers and the first member has a peripheral surface opposed to the inner surface of the tubular section which peripheral surface is recessed between nodes, the rollers being each captured in a separate space between the nodes and between the first and second members, one roller being captured between each pair of nodes about the periphery of the first member, the recesses being smoothly ramped up to the nodes to wedge rollers between the first and second members as they move towards the nodes.

4. A coupling as claimed in Claim 2:

wherein the interengagement means are twin sprags mounted about the first member and retained thereto in a manner permitting tilting in either of the two angular directions of the first member, the twin sprags being operative to engage with the second member upon tilting in either direction to wedge between the first and second members.

5. A coupling as claimed in any one of the preceding Claims 2 to 4 wherein:

a finger plate is rotationally mounted coaxially with the first and second members, the finger plate providing fingers extended into the space between the first and second members, the fingers permitting an angular movement of the interengagement means therebetween that is less than the angular movement otherwise possible between the nodes, the finger plate being actioned by an inertia means of the inertia mechanism to lag back against the direction of rotation of the first member.

6. A coupling as claimed in Claim 5:

wherein locking buttons slide in grooves in

the first member and the finger plate has projections into the grooves behind the locking buttons, the locking buttons controlling movement of the finger plate.

7. A coupling as claimed in Claim 6 wherein:

the finger plate interacts with an inertia plate via the locking buttons to limit the finger plate movement, the locking buttons being located at predetermined positions by action of the inertia plate.

8. A coupling as claimed in Claim 7 wherein:

the inertia plate has a projection thereon that is passed through a window in the finger plate to engage with an inertia crescent that moves in a channel containing the locking buttons and influence the buttons.

9. A coupling substantially as hereinbefore described with reference to the drawings.

DATED this twenty-ninth day of May 1991.

SAMUEL ARTHUR THOMAS WOODBRIDGE,
by his Patent Attorneys,
GRANT ADAMS & COMPANY.

DRAWINGS

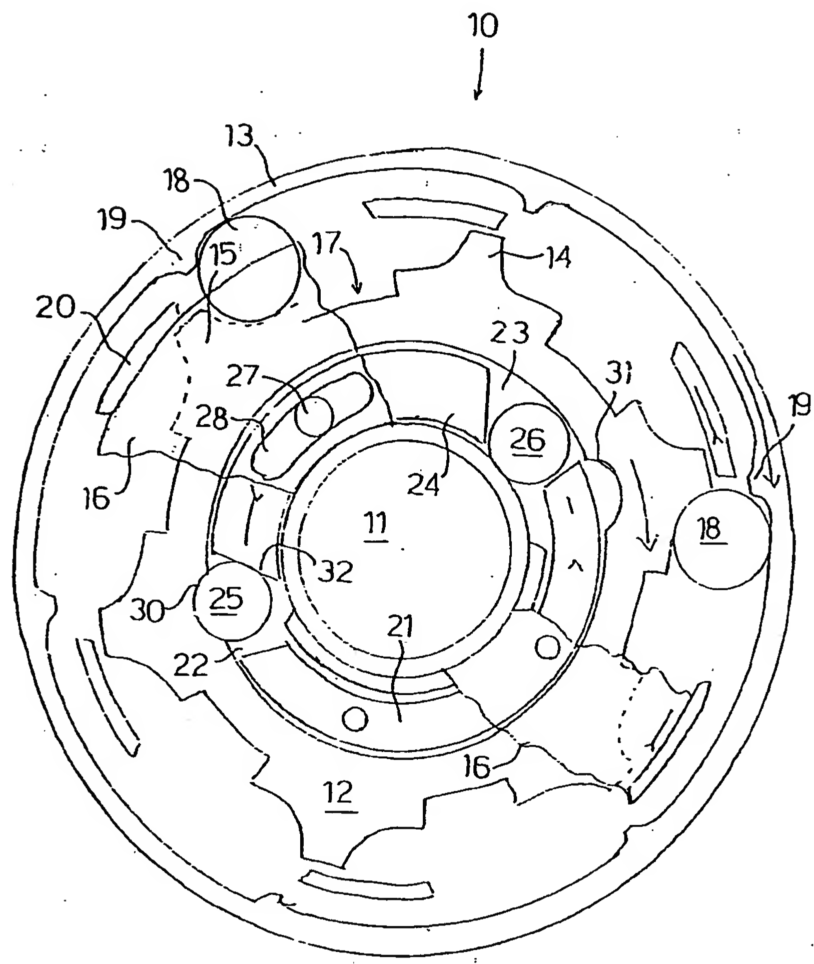

10
13
18
19
15
17
14
20
23
31
19
27
28
24
26
16
11
18
32
30
25
21
22
16
12

FIG 1

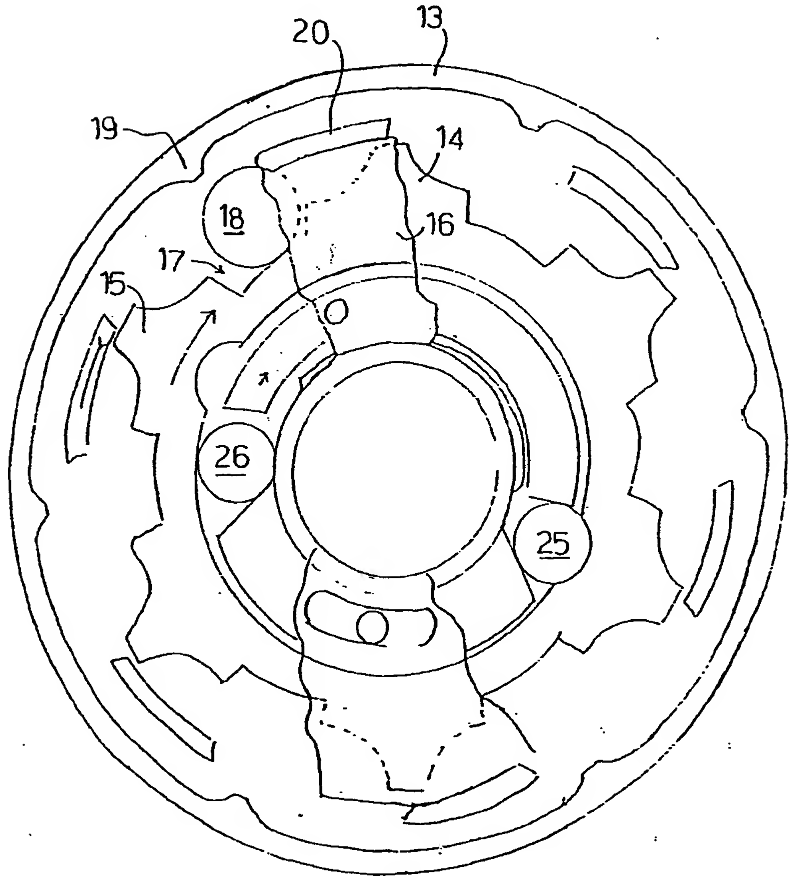


FIG 2

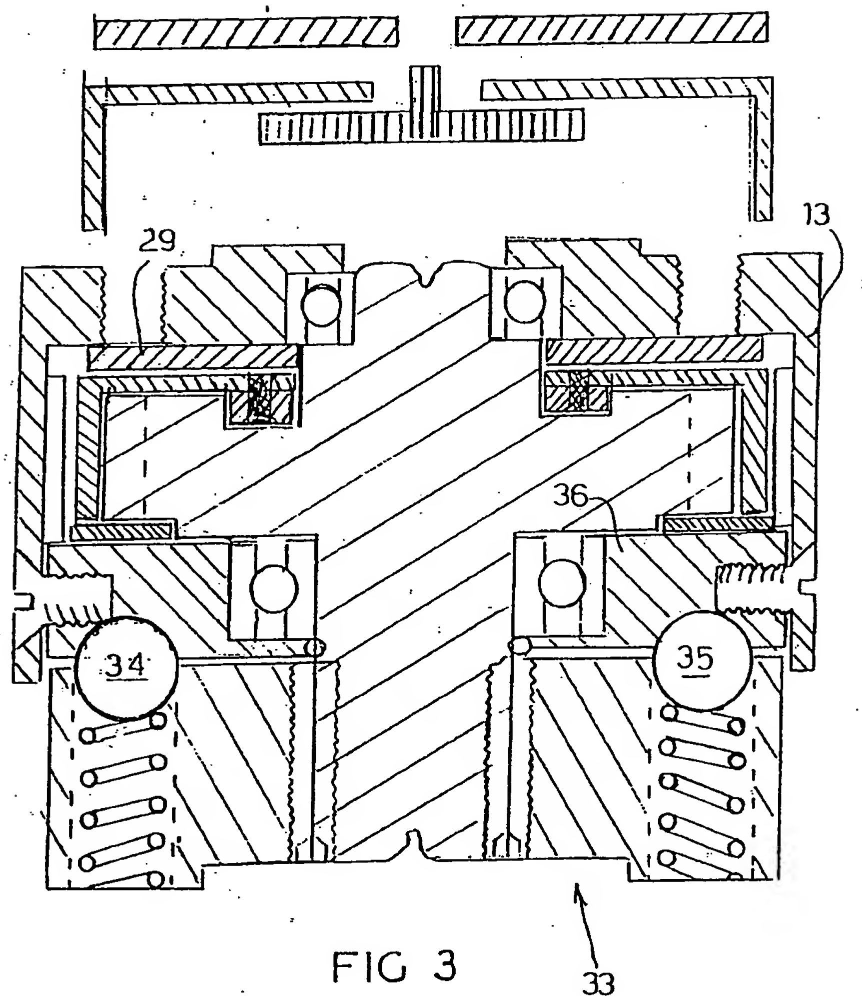
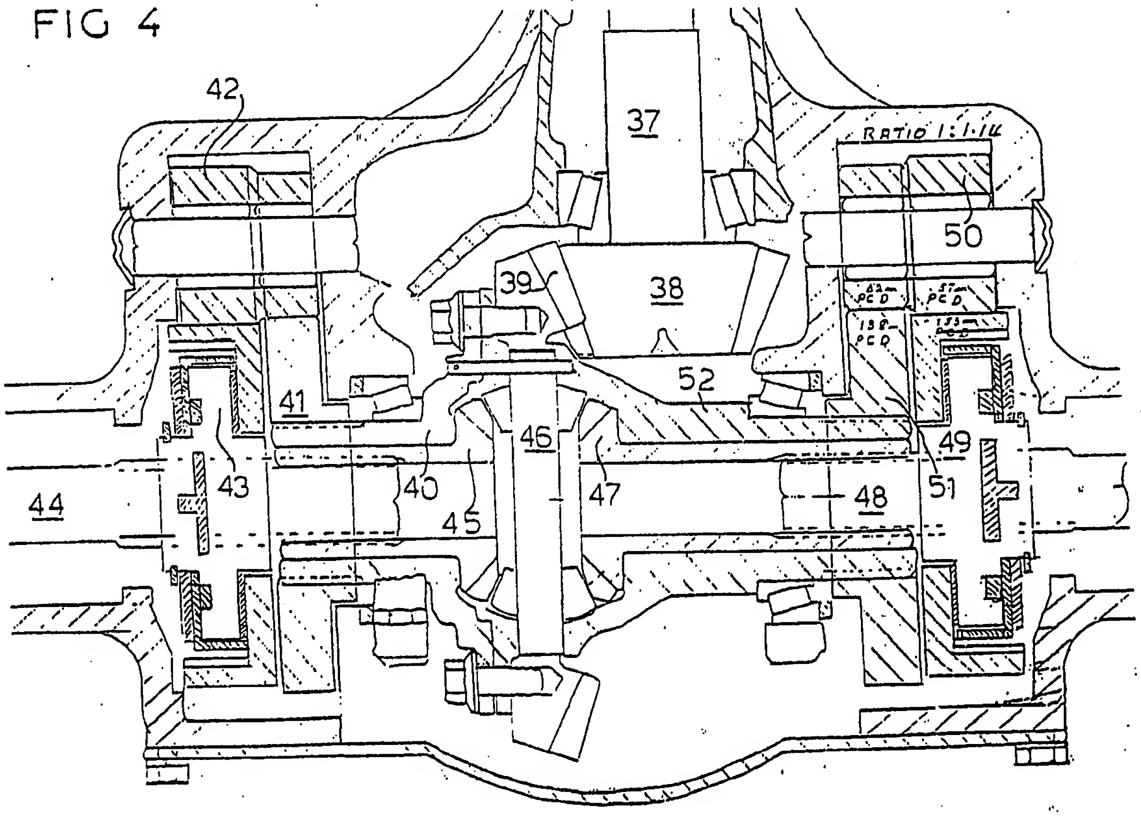


FIG 3

FIG 4



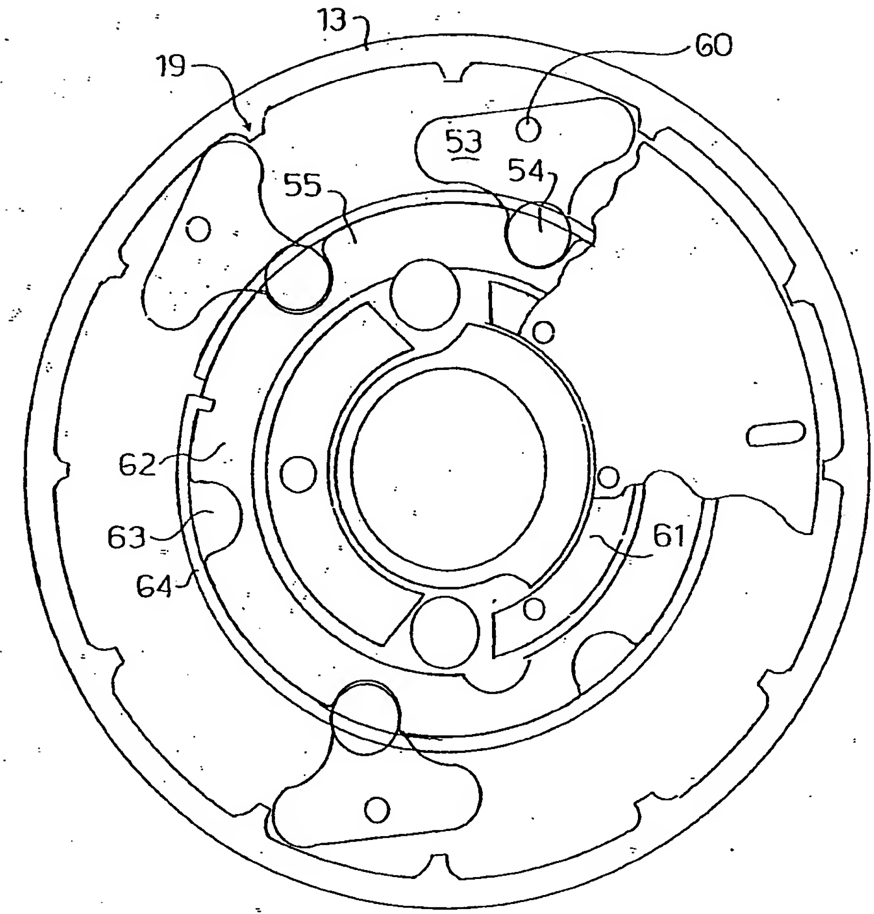


FIG 5

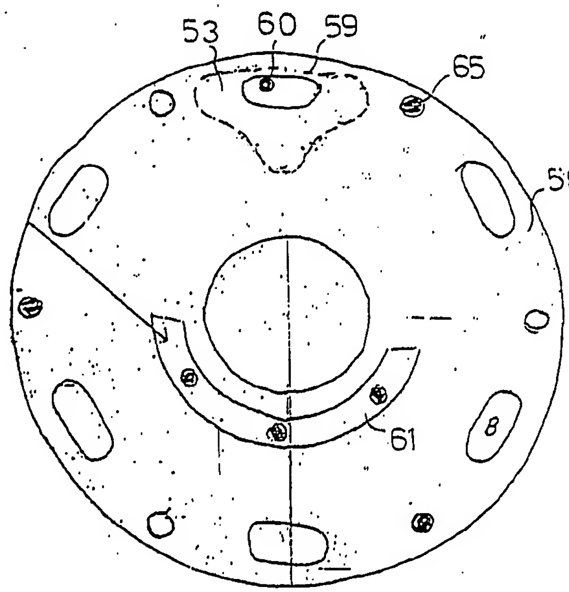


FIG 6

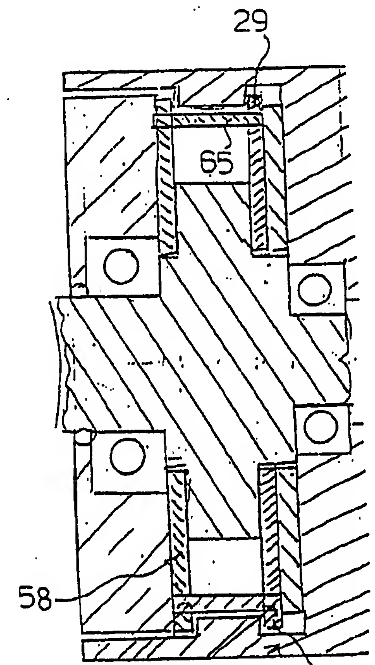


FIG 7

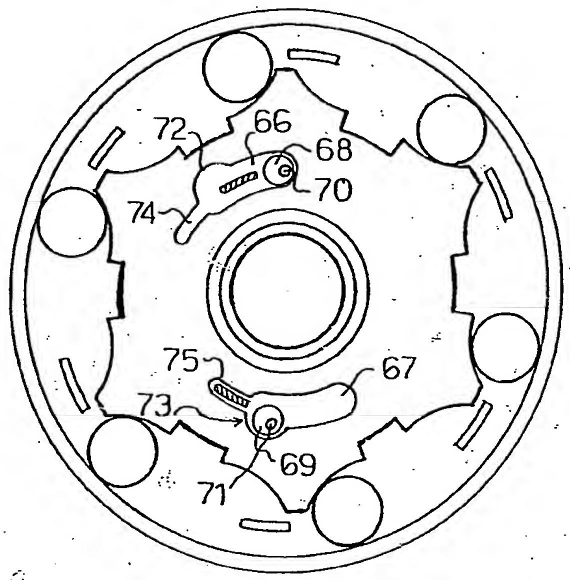


FIG 8

FIG 10